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Woodland Caribou Inventory in the Upper Moberly River and McAllister Creek Drainages, March 1996

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1.0 INTRODUCTION

Information on the distribution and abundance of woodland caribou *(Rangifer tarandus caribou)* in the Williston Reservoir watershed was fragmentary until the mid-1990's. Recent studies and inventories have identified the distribution and numbers of several herds throughout the watershed (Murray 1992; TERA 1995, 1996, 1997; Wood 1994, 1995a,*b*, 1996, 1998; Hengeveld and Wood 1998; Backmeyer and Wood, in prep *b)*. The majority of woodland caribou herds residing in the Williston watershed are northern ecotype caribou which forage primarily on terrestrial lichens. Prime winter range for this ecotype includes low elevation lodgepole pine or pine/spruce stands, and windswept alpine slopes (Stevenson 1991, Wood 1996). Total count inventories of woodland caribou wintering on mountain ranges in the Upper Moberly River and McAllister Creek drainages (Mt. Frank Roy/Mt. Monteith area) were previously conducted in conjunction with the 1992, 1994 and 1995 winter surveys of transplanted Stone's sheep (Wood 1992, 1*995a,b)*. Reconnaissance level ungulate surveys have also been conducted in the Upper Moberly River and McAllister Creek drainages by TERA Environmental Consultants Ltd. (TERA 1995, 1996, 1997).

A fourth winter inventory of ungulates using alpine and subalpine winter habitats in the Upper Moberly River and McAllister Creek drainages south of the Peace Arm was conducted on 27 March 1996. The primary objective of the survey was to determine the population size, demographics (age/sex composition), and distribution of transplanted Stone's sheep residing in the area, the results of which are presented in Wood and Hengeveld (1998). The secondary objective was to determine the same population parameters for woodland caribou, and is the subject of this report.

2.0 SURVEY AREA AND WEATHER CONDITIONS

The survey area is located south of the Peace Arm of the Williston Reservoir in north-central British Columbia. (Figure 1). The survey area lies in the Peace Foothills and Hart Foothills ecosections of B.C.'s Central Canadian Rocky Mountains ecoregion (Demarchi 1995), on the lee side of the Hart Mountain Ranges. Bedrock types in the Hart Ranges consist primarily of erosion-resistant limestones and quartzites, resulting in moderate, rolling terrain (DeLong et al. 1994). Chinook winds (warm coastal winds flowing through the mountain passes into the valleys east of the Rocky Mountains) are common (Backmeyer and Wood, in prep a), resulting

in reduced snow accumulations and slightly milder winter conditions than in the mountains to the west. Biogeoclimatic zones in the upper elevations of these mountains include the Engelmann Spruce-Subalpine Fir (ESSFwc3) zone between 1300 and 1550 m elevation, and the Alpine Tundra (AT) zone above 1550 m (Delong et al. 1994). The survey area included alpine and subalpine habitats on six mountains in the Moberly River and Carbon Creek drainages: Boulder Ridge, Mt. Bickford, Mt. Monteith, Mt. Frank Roy, Beattie Peaks, and Mt. McAllister (Figure 2).

Weather conditions on 27 March 1996 were clear and sunny, with a light northerly wind; temperature was -12°C at 1,750 m. Boulder Ridge was over 90% snow covered, while Mt. McAllister, Mt. Frank Roy, and Beattie Peaks had many windswept areas. The south and east-facing cliffs at Mt. Monteith and Mt. McAllister were about 90% snow-free.

3.0 METHODS

The survey was conducted between 1000 and 1730 hrs on 27 March 1996, with a Bell 206 helicopter chartered from Northern Mountain Helicopters (Prince George, BC). The survey took 8.4 hours of flying time, including ferry time to and from the survey area and two refueling stops at Clearwater Camp. The inventory followed standard inventory methodology (RIC 1997), and involved a thorough search of all alpine and subalpine areas. Where the distance from the upper ESSF to the height of land was such that animals at either extreme could be missed, two or three parallel transects at different contour intervals were warranted.

The navigator (Mari Wood, Senior Wildlife Biologist, PWFWCP), searched for, counted and classified animals, and recorded the flightline and animal locations on 1:250,000 topographic maps. The two rear seat observers (Fraser Corbould, Wildlife Biologist, PWFWCP, and John Metcalfe, Regional Fish and Wildlife Manager, BC Environment Omineca Sub-Region) also searched for and classified animals. F. Corbould recorded all observations on survey forms, and J. Metcalfe recorded latitude/longitude co-ordinates for each group of caribou located using the helicopter's on-board Global Positioning System (GPS) unit. Lat/long co-ordinates were later converted into UTM co-ordinates through Arcinfo Geographic Information System (GIS). Where multiple groups of caribou were located within close proximity (e.g., 100-300 m apart), only one GPS location for the groups was obtained. Caribou were classified as males or females, and as adults or calves. Male caribou were distinguished from females based on the absence of the black vulval patch.

Figure 1. Survey area within the Williston Reservoir watershed, north-central BC.

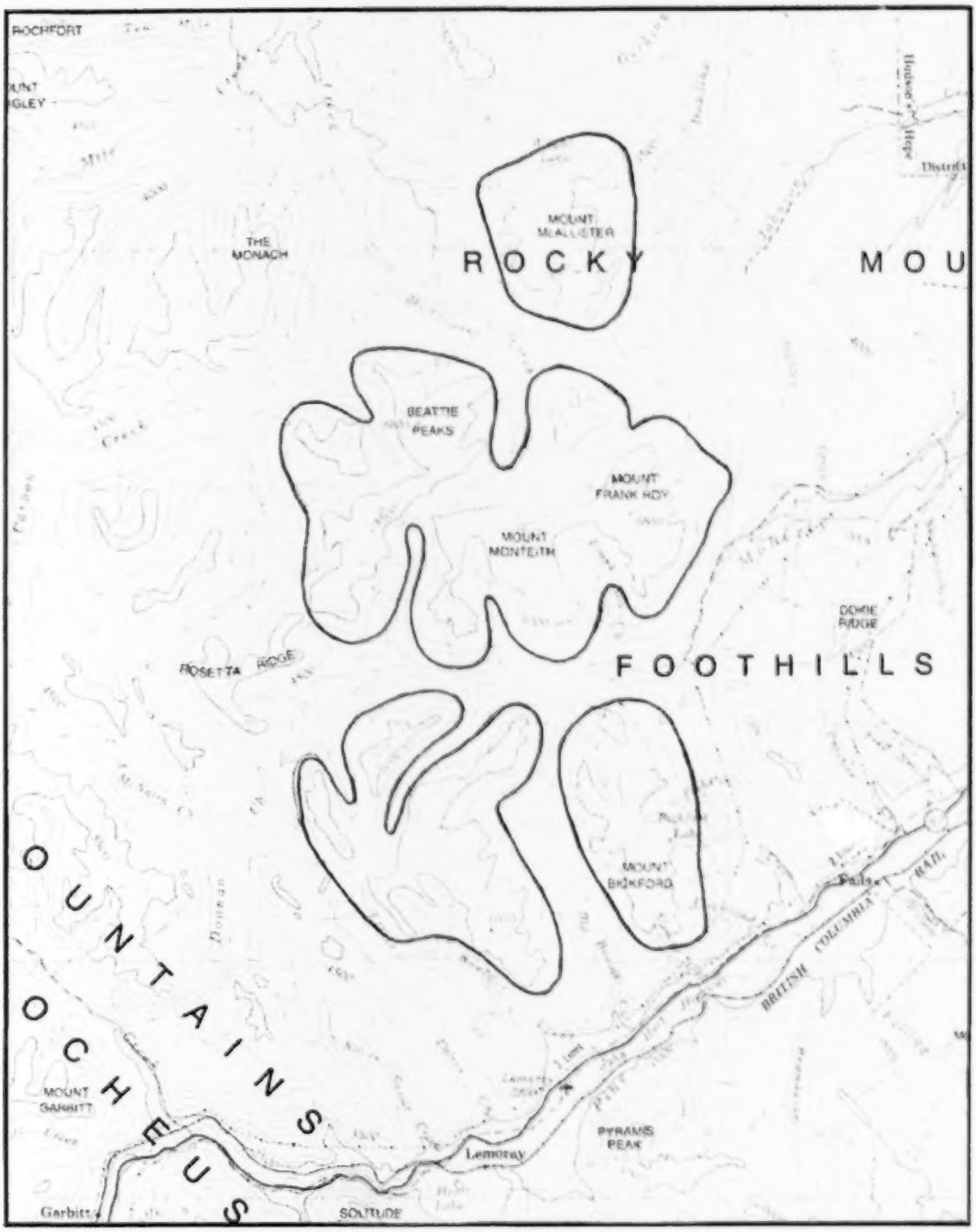

Figure 2. Specific mountains surveyed in the Mt. Frank Roy/Mt. Monteith area south of the Peace Arm on 27 March 1996. (Scale: 1:250,000)

To illustrate general winter weather trends, snow depths and densities for the winter of 1996 (Jan-Apr) were obtained from two snow monitoring stations in the Rocky Mountains closest to the study area: Pine Pass, 40 km southwest, and Lady Laurier, 70 km north of the Peace Arm (BC Environment, 1996).

4.0 RESULTS

We observed 181 woodland caribou during the survey, with caribou on all mountains surveyed except Mt. Monteith (Table 1, Figure 3, Appendix A). All caribou observed on Boulder Ridge were in the subalpine/ESSF; none were observed in the heavily snow-covered alpine. On Mt. Frank Roy, Beattie Peaks, and Mt. McAllister, all caribou were located on windswept alpine terrain. Areas north and east of Mt. McAllister appeared to also have suitable windswept alpine winter caribou habitat. The mean elevation of caribou groups observed was 1,545 ± 276 m (n=32; range = 1,280 - 1,880 m). The sex and age composition of the 181 caribou recorded on the survey was skewed towards adults, with only 17 calves observed (Table 2).

Typical group sizes (TGS) for the caribou observed were calculated according to the methods described in Jarman (1974). TGS is the size of group in which the average animal finds itself, and is a more accurate measure of the behaviour of individuals than is the frequency of groups as measured by the mean (Jarman 1974). The TGS based on the total number of caribou observed at each of the 29 map locations (Table 1) was 8.3 animals (n=181). In some cases, one map location was used to identify multiple groups of caribou that were in close proximity to each other (i.e., less than 400 m metres apart). The more accurate TGS calculated using all the smaller sub-groups is 7.4 animals (n=181, 32 groups).

5.0 DISCUSSION

The numbers of woodland caribou observed wintering in the Upper Moberly River/Mt. McAllister Creek drainages remained relatively consistent between surveys conducted in 1995 and 1996. In 1995, 189 caribou were observed on five mountain ranges (Boulder Mtn, Mt. Bickford, Mt. Frank Roy, Mt. Monteith, and Mt. McAllister; Wood 1995*b*), while 181 caribou were observed during the 1996 survey that also included Beattie Peaks. Multiple reconnaissance-level transect surveys conducted throughout the winters of 1995 and 1996 by

Table 1. Locations and classifications[a] of woodland caribou observed on 27 March 1996 in the Mt. Frank Roy/Mt. Monteith area south of the Peace Arm of the Williston Reservoir.

Group #	Mountain	Elev (m)	Habitat	Ad M	Ad F	Cf M	Cf F	Total
1	Boulder	1600	open parkland. no windswept ridges		3			3
2	Boulder	1550	open parkland. no windswept ridges		3			3
3	Boulder	1480	just on edge of parkland and alpine	1	3			4
4	Boulder	1640	subalpine	4				4
5a	Boulder	1590	subalpine ridge, some trees	2	4	1	1	8
5b	Boulder	1590	subalpine ridge, some trees		3		1	4
Subtotal				7	16	1	2	26
6	Bickford	1700	alpine	4				4
7	Bickford	1740	subalpine		2			2
8	Bickford	1550	subalpine	4	3	1		8
Subtotal				8	5	1	0	14
9	Frank Roy	1520	alpine/subalpine	4				4
10	Frank Roy	1430	alpine slope	1	4			5
11a	Frank Roy	1400	alpine	2	4			6
11b	Frank Roy	1400	alpine	3				3
12	Frank Roy	1790	alpine		3			3
13	Frank Roy	1520	alpine, just above burned area	2	3	1		6
14	Frank Roy	1510	subalpine in old burn	1	1	1		3
15	Frank Roy	1580	alpine		2			2
16a	Frank Roy	1610	alpine	1	3			4
16b	Frank Roy	1610	alpine	3	4		1	8
Subtotal				17	24	2	1	44
17	Beattie	1880	subalpine	1	8	1		10
18	Beattie	1540	alpine/subalpine	2	6			8
Subtotal				3	14	1	0	18
19	McAllister	1650	alpine	1	3	1	1	6
20	McAllister	1700	alpine	1	4	1		6
21	McAllister	1600	on edge of alpine/subalpine (sidehill)	3	5			8
22	McAllister	1280	subalpine knob	6				6
23	McAllister	1590	alpine	4	9	3	1	17
24	McAllister	1490	alpine	1	6			7
25	McAllister	1680	subalpine, rocky slope		4		1	5
26	McAllister	1610	subalpine, rocky slope	2	1			3
27	McAllister	1670	flat alpine	3	1			4
28	McAllister	1710	flat alpine	3	10			13
29	McAllister	1680	alpine, sidehill ridge		3	1		4
Subtotal				24	46	6	3	79
TOTAL				59	105	11	6	181

[a] Ad (adult); Cf (calf), M (male), F (female)

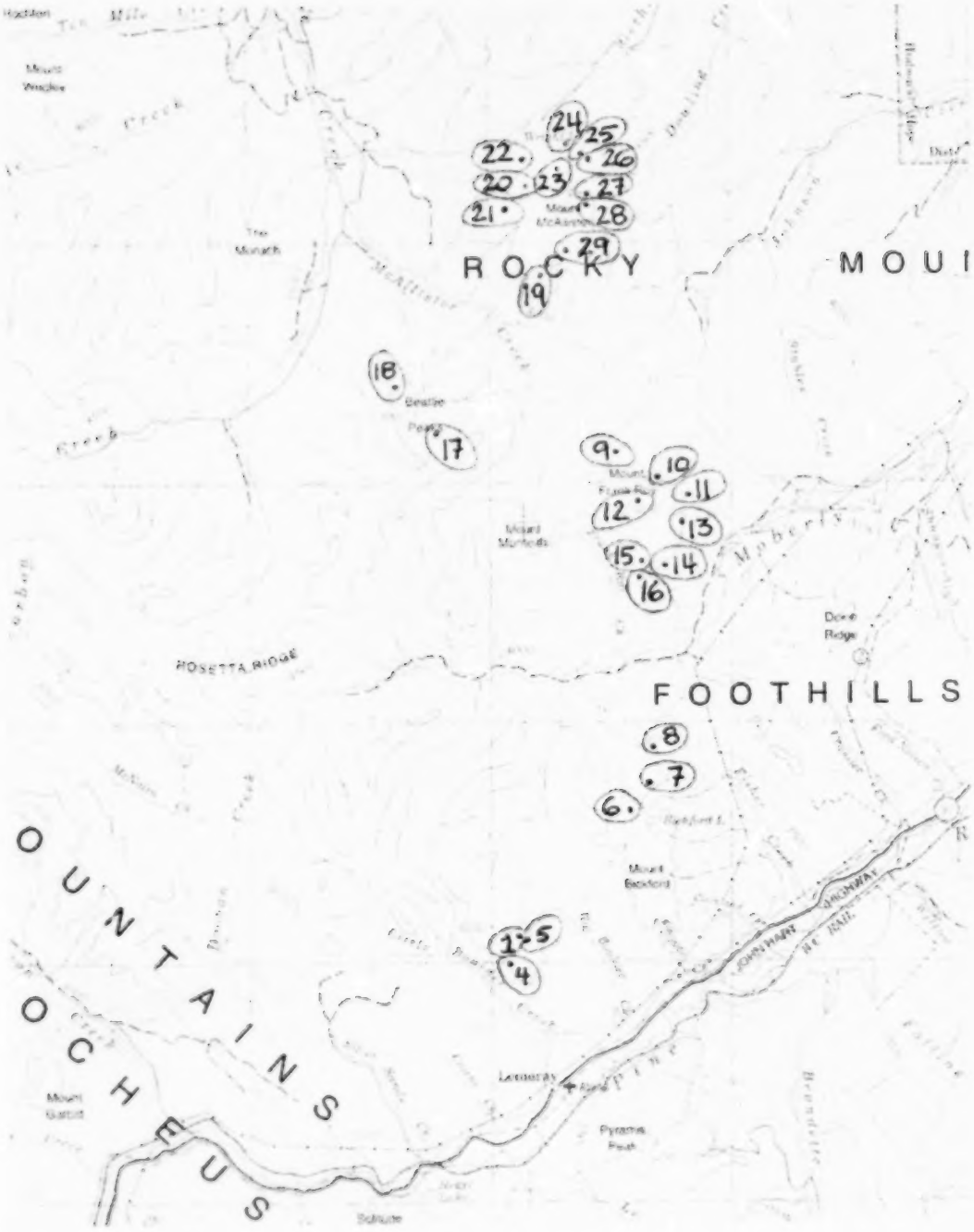

Figure 3. Locations of woodland caribou groups observed in the Mt. Frank Roy/Mt. Monteith survey area. (Scale: 1:250,000)

Table 2. Sex and age composition of woodland caribou observed during 27 March 1996.

Bulls	Cows	Calves	Bulls/ 100 Cows	Proportion of bulls in adult population	Calves/ 100 Cows	Calves/ 100 Adults	Proportion of calves in population
59	105	17	56:100	36%	16:100	10:100	9%

TERA Environmental Consultants found substantially fewer caribou in the same areas we surveyed. In 1995, TERA observed the highest number of caribou on their 8 April survey (n=122; TERA 1995). The highest number observed by TERA in 1996 was only 63 caribou on their 22/24 February survey (TERA 1996), far below the 181 caribou we observed. These data suggest that attempted total counts reveal substantially higher numbers of caribou than transects, and that total counts (in the absence of radio-collared animals) should continue to be used for woodland caribou inventories in alpine and subalpine habitats in this area. The recommended survey methodology for woodland caribou populations with radio-collared animals is stratified random block sampling using mark-resight estimation for sightability correction (RIC 1996).

The winter calf/cow ratio for woodland caribou observed on this survey was 16 calves/100 cows, almost half that observed on the previous survey in March 1995 (30 calves/100 cows, Wood 1995*b*). The number of calves observed was 9% (n=181) of the total population, down from 14% (n=189) observed in March 1995 (Wood 1995*b*). The proportion of calves observed in other caribou populations within the Williston Reservoir watershed in the 1990s ranged between 10% and 17% (Hatler 1989, Wood 1994, 1995a, 1996), with the lowest proportions (10%) also observed in 1996 on the Wolverine Range (Wood 1998) and Misinchinka Ranges (Hengeveld and Wood 1998). Woodland caribou herds are thought to increase when the recruitment of yearlings into the population exceeds 12-15% (Bergerud 1988), while populations with recruitment of <10-12% show little change (Bergerud 1974, Bergerud and Elliott 1986).

The bull/cow ratio of 56 bulls/100 cows observed during this survey was lower than the 86 bulls/100 cows observed in the same area in 1995 (Wood 1995*b*), but more comparable to the bull/cow ratio of 10 other caribou herds examined throughout northern British Columbia in the 1970s, which ranged from 35-50 bulls/100 cows (Bergerud 1980). The proportion of males we

observed in the adult population was 36%; Bergerud (1980) reported a mean of 36% for 22 caribou populations throughout North America.

Adult sex ratios in North American caribou are usually weighted to females, due primarily to the differential mortality of males and the greater longevity of females (Bergerud 1980). Low numbers of males in a population may be a result of heavy predation, hunting pressure, winter starvation (i.e., males enter the winter in poorer physical condition than females), and/or chronic poor recruitment (Bergerud, 1980). If yearling recruitment into the population is good, and the population has a younger age structure, the resulting higher number of young males in the population will increase the ratio of adult males to females (Bergerud 1980). Bergerud (1978) reported an adult sex ratio of 49 bulls/100 cows for four herds in British Columbia with calf recruitment >10%, while six herds with calf recruitment <10% showed bull/cow ratios of 33:100 (Bergerud 1978). This relationship between high adult mortality and low calf survival is suggested to result from increased predation (Bergerud 1978).

On the 1995 survey of the Mt. Frank Roy/Mt. Monteith area, both the observed calf recruitment (14%) and the bull/cow ratio (86:100) were moderately high (Wood 1995*b*). Both parameters dropped in 1996 - calf recruitment to 9% and the bull/cow ratio to 56:100 - with the latter approaching that of more typical North American caribou populations (Bergerud 1980). However, the decrease in the number of calves seen, coupled with a slightly above average proportion of bulls in the adult population, suggests the possibility that some cows and calves may have been wintering elsewhere and were therefore missed on the survey. Spatial segregation of the sexes on winter ranges has been observed in several other woodland caribou herds, with bull groups located on the periphery of the main wintering areas (R. Farnell, Yukon Renewable Resources, Whitehorse, YK, personal communication). Counts of the Finlayson and other Yukon woodland caribou herds found adult males and females to be more homogeneously mixed during the rut, resulting in higher proportions of bulls being observed at that time, than on late winter range surveys when the sexes were spatially segregated, and bull groups wintering outside of the primary winter ranges were likely missed (Yukon Renewable Resources Branch, Whitehorse, YK, unpublished data). Low calf proportions (9-10%) were also observed in two other caribou populations in the Williston Reservoir watershed in 1996 (Wood 1998, Hengeveld and Wood 1998). Snow depths in 1996 were noted to be higher than normal (BC Environment 1996) in all areas where the PWFWCP conducted caribou surveys, which may have influenced the distribution of wintering caribou.

Though the total numbers of caribou observed in 1995 and 1996 were similar (n=189 and n=181 respectively), they were found in a greater number of smaller groups in 1996 (TGS=12.8 in 1995; TGS=7.4 in 1996). This trend toward small group sizes was also observed during two other surveys in the Williston Reservoir watershed in 1996: Wolverine Ranges (TGS=7.1, n=204, 42 groups; Wood 1998), and Misinchinka Ranges (TGS=5.2, n=60, 15 groups; Hengeveld and Wood 1998). Caribou group sizes are often largest in March, and are correlated with increasing snow depths and densities through late winter (Wood 1996). Caribou may form larger groups in deeper and/or denser snow conditions to increase foraging efficiency (i.e., more animals can dig larger feeding craters), and to benefit through shared risk and increased vigilance against predators that can travel more easily on packed snow. Snow depths in March 1996 were higher than normal in all areas of the watershed (BC Environment 1996), however, group sizes were noted to be substantially lower, suggesting that group sizes may not be linked solely to snow depths. Although snow depths and densities may increase throughout winter, other weather variables such as wind can play important roles. Persistent winds, particularly warm Chinook wind events, that scour alpine slopes can substantially reduce snow accumulations, rendering formation of larger groups of animals unnecessary.

6.0 RECOMMENDATIONS

Additional inventories of woodland caribou wintering in the Rocky Mountain foothills south of the Peace Arm should be conducted. Intensive surveys over a broader area would help determine if some cow/calf groups are being missed, and support or refute the hypothesis that cow/calf groups may be spatially segregated from barren cows and mature bulls during winter. All alpine and subalpine mountainous habitats south of the Peace Arm to at least Highway 97, and east of Clearwater Creek, should be surveyed. A fall rut survey conducted in mid-October, followed by a late winter range survey in early March will also help to determine if certain age or sex classes in the population are being missed on winter surveys.

A caribou radio-telemetry study should also be considered. Monitoring radio-collared animals in conjunction with annual population inventories would assist in determining:

- the distribution, seasonal movements, seasonal habitat use, and population demographics of caribou wintering in the Rocky Mountain foothills south of the Peace Arm.
- the number and geographic distribution of different caribou herd(s) wintering in the area, thus providing an indication of how this herd(s) links (if at all) with caribou that winter south of Highway 97, and west of Clearwater Creek.

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APPENDIX A

GPS coordinates for locations of woodland caribou groups observed.

Grp. No.	Easting	Northing
1	531299	6161118
2	531290	6162416
3	527999	6167958
4	530678	6159815
5a	531509	6161119
5b	531509	6161119
6	535774	6166160
7	536814	6167282
8	536695	6168950
9	535130	6180995
10	536706	6180080
11a	538490	6179354
11b	538490	6179354
12	536402	6178965
13	537979	6178051
14	537156	6176374
15	536216	6176181
16a	536222	6175439
16b	536222	6175439
17	526654	6182047
18	525913	6183712
19	532359	6188022
20	531493	6192094
21	531077	6192094
22	531379	6193580
23	532637	6192662
24	533359	6193230
25	534197	6193230
26	534303	6193045
27	534000	6191745
28	534003	6191374
29	533171	6189698